Feb. 18, 1930. H. J. KERR 1,747,676

FURNACE AND PROCESS OF OPERATING THE SAME

Filed Oct. 8, 1927

Fig-3

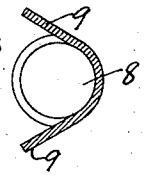


Fig-2

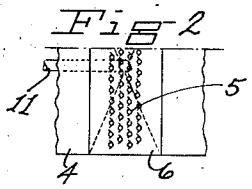


Fig-1

Fig-4

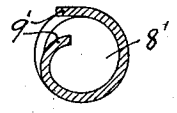


Fig-5



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Patented Feb. 18, 1930 1,747,676

UNITED STATES PATENT OFFICE

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FURNACE AND PROCESS OF OPERATING THE SAME

Application filed October 8, 1927. Serial No. 224,800.

This invention relates to a furnace and the process of operating it in such a manner that the heat developed by the combustion is readily absorbed by heat absorbing surfaces in proximity to the combustion zone or in the path of the products of combustion. The invention will be understood from the description in connection with the accompanying drawings, in which Fig. 1 is a somewhat diagrammatic side elevation of an illustrated embodiment of the invention shown applied to a water tube boiler; Fig. 2 is a section along the line 2—2 of Fig. 1; Fig. 3 is a section on an enlarged scale showing one of the details; and Figs. 4 and 5 are sections similar to Fig. 3 showing modifications of the detail.

In the drawings reference character 1 indicates a furnace above which a water tube boiler 2 of the Babcock and Wilcox type is shown so located that the products of combustion from the furnace pass across the water tubes to generate steam in the boiler in the well known manner. The walls of the furnace 1 may be lined with water tubes 3 that may be connected to the water circulation system of the boiler in any convenient manner. An outlet conduit 4 for waste products of combustion leads to a stack and a dust collector 5 is located in this conduit. A cover plate 6 is provided for the dust collector so that ready access can be obtained to the collector from the outside.

The dust collector may conveniently be made of a series of parallel tubes, the upper ends of which extend through a tube plate and the lower ends extend into an extension or pocket 7. Each one of the tubes 8 is slitted for the greater portion of its length on the side toward the boiler and the edges are turned outward, as indicated at 9 (Fig. 3), to provide an opening into the tube from the side, thus making a somewhat V-shaped pocket of each tube.

The tubes may be slitted in a different position from that of Fig. 3, as shown by the tubes 8′ in Fig. 4, and one of the edges bent outwardly and the other inwardly, as indicated at 9′; or the tubes may be slitted as indicated by the tube 8″ in Fig. 5 both of the edges turned inwardly as indicated at 9″. In each case, the tubes are so shaped that the hot products of combustion carrying dust or soot can enter and find a pocket where the gases enter and permit the dust or soot to settle downwardly. The dust or soot drops downwardly into the pocket or extension 7 while the gases pass into the stack. The body of dust that collects in the extension 7 seals the lower ends of the tubes 8 so that the gases cannot bypass under the lower ends of the tubes on the way to the stack. A pipe 11 leads from the extension 7 to a screw conveyor 12 that is provided with a screw that is driven by the driving mechanism 13 in the usual manner. The conveyor 12 leads to a conduit 14 which in turn leads from an outside supply of dust or soot (not shown). A dust box or mixing chamber 15 is provided for the conduit 14 and a conduit 16 leads from this dust box 15.

A supply of powdered fuel 17 has a conduit 18 leading therefrom to the junction point 19 with the conduit 16 and from thence to the burner or burners 20 for the furnace.

The operation is as follows: Soot or dust that collects in the extension 7 is conveyed through the pipe 11 and conveyor 12 to the dust box 15 where it may be mixed with an additional amount of dust from an outside source. The dust is admitted with the fuel from the source 17 and enters the furnace where the fuel is ignited and the dust is again carried to the outlet conduit 4 and a portion of the same collected and returned through the furnace.

The object of this invention is to cause the heat absorbing surfaces to absorb the heat from the products of combustion more rapidly than is the case in the usual method of furnace operation or of burning fuel in a furnace. The outlet gases will be cooler and will therefore carry away less heat as waste heat than is the usual case. It has been found in actual practice that this effect can be produced by introducing dust or soot into the furnace while the products of combustion are being burned. The reason for this is not clearly understood, but may possibly be due to the fact that the dust particles radiate heat rapidly after they themselves have become

heated in the furnace. The maximum beneficial effect apparently depends to some extent upon the amount of dust that is added to the fuel and air, and this amount depends in turn upon the nature of the fuel and the location of the heat absorbing surfaces. The word "dust" is used in the claims to indicate dust in the ordinary sense or dust that may be carbon particles or particles of mineral matter or other material that is in a sufficiently fine condition to be entrained with the products of combustion as a result of the ordinary draft in the furnace.

I claim:

1. The process which comprises introducing dust into a furnace which is substantially non-combustible at the temperature of the furnace in addition to the fuel and air that is introduced for combustion purposes.

2. The process which comprises introducing dust into a furnace which is substantially non-combustible at the temperature of the furnace in addition to the fuel and air that is introduced for combustion purposes, said dust being recovered from the flue gases.

3. The process which comprises introducing dust into a furnace which is substantially non-combustible at the temperature of the furnace in addition to the fuel and air that is introduced for combustion purposes, thus causing heat generated by the combustion to be transmitted more rapidly to heat absorbing surfaces.

4. The process which comprises introducing dust into a furnace which is substantially non-combustible at the temperature of the furnace in addition to the fuel and air that is introduced for combustion purposes, said dust being of a sufficient degree of fineness to cause it to be entrained with the products of combustion in the furnace.

5. In a device of the character described, a furnace, heat absorbing surfaces in said furnace, and means to introduce into said furnace dust which is substantially non-combustible at the temperature of the furnace.

6. In a device of the character described, a furnace, heat absorbing surfaces in said furnace, and means to introduce into said furnace dust which is substantially non-combustible at the temperature of the furnace and cause the same to contact with said heat absorbing surfaces.

7. In a device of the character described, a furnace, a stack, heat absorbing surfaces in said furnace, and means to introduce dust from said stack which is substantially non-combustible at the temperature of the furnace.

8. In a device of the character described, a furnace, a stack, heat absorbing surfaces in said furnace, and means to separate dust which is substantially non-combustible at the temperature of the furnace from the waste products of combustion in said stack and introduce it into said furnace.

9. In a boiler, means to introduce dust which is substantially non-combustible at the temperature of the furnace into the furnace of said boiler in addition to the fuel and air that is introduced therein.

10. In a boiler, means to separate from the flue gases from said boiler dust which is substantially non-combustible at the temperature of the furnace and introduce it into the furnace of said boiler.

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